Advanced Component Technology Program

Modular Dual-band Ku/Ka Antenna Tile with Digital Calibration (K-Tile)

Completed Technology Project (2015 - 2017)

Project Introduction

Following a very successful development of a new, highly accurate, digitally calibrated (but large and high-power) TRM [Transmit/Receive Module], we will leverage this demonstrated architecture. We will reduce the size/power of the ~18x6" 100W digitally calibrated TRM, developed for DESDynI to a much smaller, lower power, modular [PC104 footprint (10x10cm), and a 10W output power] TRM. The TRM elements required to enable digital calibration will be fabricated within a GaN MMIC, using a commercially available foundry. The estimation/control algorithms will be modified to fit within a CubeSat form-factor processer. In fact, platforms with Xilinix V6 processors are already available for CubeSats, and our current flight model is able to digitize, perform our digital calibration and do beamforming for 4-channels, The V6 should be capable of handling many more channels. This will drastically reduce the size and power, enabling SweepSAR or other digital beamforming radars to be hosted on small platforms. Science goals for atmospheric studies include a K-band channel to measure cloud droplet size, glaciation height, and cloud height. A small form factor digitally calibrated TR front-end will enable the very accurate measurements required for estimating cloud and aerosol properties, through polarimetry. The same technology is capable of miniaturizing the front-end of a Ku/Ka band radar required for highly accurate measurements required for estimating snow/ice height. The dual-polarization-mode SAR enables discrimination of the radar backscatter into volume and surface components. This work will develop a GaN TR module front-end, which includes the architecture enabling digital calibration. Unlike prior efforts, this will miniaturize the successful digital calibration concept to very small form factors. We will develop the devices to accommodate a PC104 form factor (CubeSat), to leverage that standard, and to allow use on CubeSat, but our target applications are better served by other small platforms, such as airborne (small remotely piloted), and small-sats. As such, our future plans will propose this to flight demos (InVest), and airborne (IIP) to enable future flight programs.

ALHAT - ETD Autonomous Landing & Hazard Avoidance Tech Earth Science Technology Office

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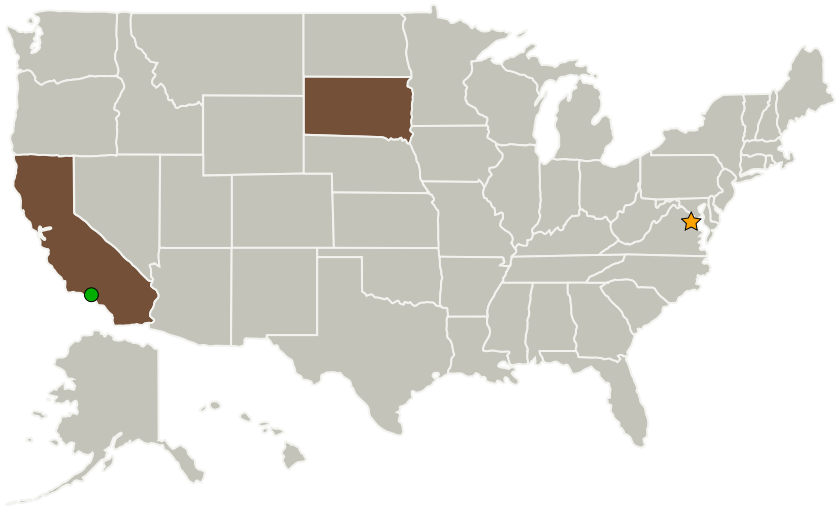
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★NASA Headquarters(HQ)	Lead Organization	NASA Center	Washington, District of Columbia
●Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	South Dakota

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

NASA Headquarters (HQ)

Responsible Program:

Advanced Component Technology Program

Project Management

Program Director:

Pamela S Millar

Program Manager:

Amber E Emory

Principal Investigator:

James P Hoffman

Co-Investigator:

Karen R Piggee

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Images

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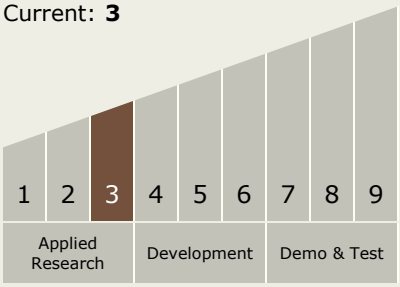
(https://techport.nasa.gov/image/5108)

Technology Maturity (TRL)

Start: **3**
Current: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destination

Earth